

Worksheets

The worksheets provided give examples of information needed to do traffic and equipment engineering. However, more detailed information is needed to fully engineer a system. Consult your Northern Telecom representative and use a configuration tool, such as Autoquote or Meridian Configurator, to fully engineer a system.

Memory values, which vary for each generic of software, are given in *Meridian 1 capacity engineering* (553-3001-149).

Worksheet A: Load balancing

LOAD BALANCING

CUSTOMER _____
DATE _____

One sheet for the complete system.

Total system load = _____ CCS

Voice loops required = _____

IPE/PE modules required = _____

Average CCS per module =

Total system load CCS

IPE/PE modules required

= _____ CCS

Average CCS per loop =

Total system load CCS

Voice loops required

= _____ CCS

LOOP NUMBER	SHELVES ASSIGNED	CCS PER LOOP	CCS PER SHELF

553-5366

Worksheet B: Card distribution

CIRCUIT CARD DISTRIBUTION

CUSTOMER _____ DATE _____

One sheet for the complete system.

Divide the total number of a card type by the total number of IPE/PE modules to arrive at a cards-per-module number.

CARD TYPE	QUANTITY	TOTAL IPE/PE MODULES	CARDS PER MODULE

553-5367

Worksheet C: Multiple appearance group assignments

MULTIPLE APPEARANCE GROUP (MAG) ASSIGNMENTS

CUSTOMER _____ DATE _____

One sheet for the complete system.

LOOP #	LOOP #	LOOP #	LOOP #	LOOP #
MAG # Single-line TN Multi-line TN	MAG # Single-line TN Multi-line TN	MAG # Single-line TN Multi-line TN	MAG # Single-line TN Multi-line TN	MAG # Single-line TN Multi-line TN
MAG # Single-line TN Multi-line TN	MAG # Single-line TN Multi-line TN	MAG # Single-line TN Multi-line TN	MAG # Single-line TN Multi-line TN	MAG # Single-line TN Multi-line TN
MAG # Single-line TN Multi-line TN	MAG # Single-line TN Multi-line TN	MAG # Single-line TN Multi-line TN	MAG # Single-line TN Multi-line TN	MAG # Single-line TN Multi-line TN
MAG # Single-line TN Multi-line TN	MAG # Single-line TN Multi-line TN	MAG # Single-line TN Multi-line TN	MAG # Single-line TN Multi-line TN	MAG # Single-line TN Multi-line TN
MAG # Single-line TN Multi-line TN	MAG # Single-line TN Multi-line TN	MAG # Single-line TN Multi-line TN	MAG # Single-line TN Multi-line TN	MAG # Single-line TN Multi-line TN
CARDS Single-line ____ Multi-line ____	CARDS Single-line ____ Multi-line ____	CARDS Single-line ____ Multi-line ____	CARDS Single-line ____ Multi-line ____	CARDS Single-line ____ Multi-line ____

553-4054

Worksheet D: Station load balancing

STATION LOAD BALANCING

CUSTOMER _____ DATE _____

One sheet required for the complete system.

Total single-line TNs to be assigned _____

Less number of single-line TNs assigned to MAG – _____

Equals number of single-line TNs not in MAG = _____

Single-line TNs not in MAG = _____ Number of single-line TNs not in MAG

Total IPE/PE modules Assigned per module

Total multi-line TNs to be assigned _____

Less number of multi-line TNs assigned to MAG – _____

Equals number of multi-line TNs not in MAG = _____

Multi-line TNs not in MAG = _____ Number of multi-line TNs not in MAG

Total IPE/PE modules Assigned per module

553-5372

Worksheet E: Multiple appearance group record

MULTIPLE APPEARANCE GROUP (MAG) RECORD

CUSTOMER _____ DATE _____

One worksheet per system.

MAG NUMBER	LOOP NUMBER	DN	STATUS DESIGNATOR	TELEPHONE TYPE	DEPT.

553-4059

Worksheet F: Card assignment

CIRCUIT CARD TO MODULE ASSIGNMENT

CUSTOMER _____ DATE _____

One table for each PE shelf in the system.

												TOTAL CARDS	CCS LOAD
LOOP # _____	MODULE # _____												
Position		1	2	3	4	5	6	7	8	9	10		
Type													
LOOP # _____	MODULE # _____												
Position		1	2	3	4	5	6	7	8	9	10		
Type													
LOOP # _____	MODULE # _____												
Position		1	2	3	4	5	6	7	8	9	10		
Type													
LOOP # _____	MODULE # _____												
Position		1	2	3	4	5	6	7	8	9	10		
Type													

553-5369

Worksheet G: Terminal number assignment

TN ASSIGNMENT RECORD											
CUSTOMER _____								DATE _____			
One sheet for each IPE/PE module in the system.											
LOOP # _____				MODULE # _____				GROUP # _____			
CARD POS	CARD TYPE	UNIT	DN	RTMB	CUST	CARD POS	CARD TYPE	UNIT	DN	RTMB	CUST
1		0				6		0			
		1						1			
		2						2			
		3						3			
		4						4			
		5						5			
		6						6			
		7						7			
2		0				7		0			
		1						1			
		2						2			
		3						3			
		4						4			
		5						5			
		6						6			
		7						7			
3		0				8		0			
		1						1			
		2						2			
		3						3			
		4						4			
		5						5			
		6						6			
		7						7			
4		0				9		0			
		1						1			
		2						2			
		3						3			
		4						4			
		5						5			
		6						6			
		7						7			
5		0				10		0			
		1						1			
		2						2			
		3						3			
		4						4			
		5						5			
		6						6			
		7						7			

DN = Directory Number, RTMB = Route Member Number (trunks)

553-5368

Worksheet H: System assignment plan

SYSTEM ASSIGNMENT PLAN

CUSTOMER _____ DATE _____

One sheet for each equipment voice loop.

LOOP #: _____ GROUP #: _____

Modules equipped _____

Trunks working _____

Trunks equipped _____

Consoles _____

DTRs _____

Single-line TNs _____

Multi-line TNs _____

MAGs assigned _____

Load capacity _____

RECOMMENDED ASSIGNMENT PLAN _____

553-5370

Worksheet I: Growth forecast

GROWTH FORECAST

CUSTOMER _____ DATE _____

One sheet for each customer and one sheet for the system as a whole.

	CUTOVER	2-YR	5-YR	CCS/T
CONSOLES				
TELEPHONES:				
Single-line TNs				
Multi-line TNs				
TRUNKS:				
2-way				
1-way in				
1-way out				
DID				
Tie				
CCSA				
InWATS				
OutWATS				
FX				
Private line				
Dial dictation				
Paging				
RAN				
AIOD				
DTI				
E&M 2W				
E&M 4W				

Line CCS/T _____
 Total trunk CCS/T _____
 Intra-CCS/T _____

553-4041

Worksheet J: Total load

LINE, TRUNK, AND CONSOLE USAGE

CUSTOMER _____ DATE _____

One sheet for each customer for cutover, 2-year, and 5-year interval.

One sheet for the system cutover, 2-year, and 5-year interval.

LINE USAGE:

Single-line TNs _____ X _____ CCS/T = _____ CCS

Multi-line TNs _____ X _____ CCS/T = _____ CCS

TOTAL LINE LOAD = _____ CCS

TRUNK USAGE:

Trunk route	Number of TNs accessing route	CCS/T per trunk route	Total CCS load per trunk route	
_____	_____	X _____	= _____	CCS
_____	_____	X _____	= _____	CCS
_____	_____	X _____	= _____	CCS
_____	_____	X _____	= _____	CCS
_____	_____	X _____	= _____	CCS
_____	_____	X _____	= _____	CCS
_____	_____	X _____	= _____	CCS

TOTAL TRUNK LOAD = _____ CCS

CONSOLE USAGE:

Number of consoles _____ X 30 CCS = _____ TOTAL CONSOLE LOAD

DIGITONE RECEIVERS:

Table _____ Number of DTRs _____ TOTAL DTR LOAD _____ CCS

TOTAL LOAD _____ CCS

553-4042

Worksheet K: Network loops

NETWORK LOOP CALCULATION

CUSTOMER _____ DATE _____

One sheet for each customer. One sheet for the complete system.

	Total load	CCS per load	Number of loops	Round to next highest number
Cutover	_____ ÷ _____	_____	= _____	_____
2-year	_____ ÷ _____	_____	= _____	_____
5-year	_____ ÷ _____	_____	= _____	_____

Number of network loops required at 2 years = _____

Number of network groups required at 2 years (use table below) = _____

Number of network groups	Maximum number of voice loops	Without Digitone trunks 744/560 CCS/loop	With Digitone trunks 720/540 CCS/loop
1	28	20,832 / 15,680	20,160 / 15,120
2	56	41,664 / 31,360	40,320 / 30,240
3	84	62,496 / 47,040	60,480 / 45,360
4	112	83,328 / 62,720	80,640 / 60,480
5	140	104,160 / 78,400	100,800 / 75,600

Note 1: The table above is based on an 85 percent utilization level.

For superloops, the *maximum* CCS/loop is 875 without Digitone trunks, 848 with Digitone trunks. Using the 85 percent utilization level, the CCS/loop is 744 without Digitone trunks, 720 with Digitone trunks.

For regular loops, the *maximum* CCS/loop is 660 without Digitone trunks, 560 with Digitone trunks. Using the 85 percent utilization level, the CCS/loop is 560 without Digitone trunks, 540 with Digitone trunks.

Note 2: At high traffic levels the CPU capacity needs to be calculated to determine whether there is sufficient capacity to process the given load.

553-5361

Worksheet L: Network loop balancing

BALANCING NETWORK LOOPS OVER NETWORK GROUPS

CUSTOMER _____ DATE _____

One sheet for the complete system.

CUSTOMER	NETWORK GROUP 0	NETWORK GROUP 1	NETWORK GROUP 2	NETWORK GROUP 3	NETWORK GROUP 4

553-4051

Worksheet M: Peripheral equipment modules (continued)
PE card calculations

PE CARD CALCULATIONS			
CUSTOMER _____		DATE _____	
One for the complete system at cutover, 2-year, and 5-year interval.			
NUMBER OF:	CUTOVER	2-YR	5-YR
DTR cards			
Digital line cards			
Consoles			
AIOD trunks			
500-type telephone TNs ÷ 4			
CO/FX/WATS/private line trunks ÷ 2			
2-W E&M/DX/paging trunks ÷ 2			
Loop signaling/DID trunks ÷ 2			
Dictation trunks ÷ 2			
RAN trunks ÷ 4			
4-W E&M/DX trunks ÷ 2			
TOTAL CARDS			

PE MODULE CALCULATIONS:
 Use the total cards required at 2 years to determine the number of PE Modules to be provisioned at cutover.

PE Modules required = Total cards (round to next higher number) ÷ 8.5

NUMBER OF PE MODULES REQUIRED AT CUTOVER _____

553-5362

Worksheet N: Conference and TDS loop requirements

CONFERENCE AND TDS LOOP REQUIREMENTS

CUSTOMER _____ DATE _____

One sheet for the complete system.

CONFERENCE LOOP REQUIREMENTS:

Conference loops are provisioned according to the 2-year network loop requirements.

Conference loops required = _____

TONE AND DIGIT LOOP REQUIREMENTS:

Tone and digit loops are provisioned according to the 2-year network loop requirements.

Tone and digit loops required = _____

ESTIMATED REAL TIME USAGE (ERTU) CALCULATION:

$$\text{ERTU} = \frac{\text{Total line load} \times 100 \times T}{150 \times 2} / 2100 = \text{Percent utilization of CPU real time}$$

Legend:

- Total load = the sum of total line load and total trunk load of the 2-year figure, in CCS
- T = the average processing time for a call in seconds (using 1.2 s for option 21 and 0.24 s for options 51, 61, and 71); these are average numbers for a featured call
- 150 = the average holding time in seconds
- 2520 = the rated capacity (70% loading) of the CPU in seconds
- 2 = the total originating and terminating traffic is divided by 2 to account for only call originations

553-4046

Worksheet O: Unprotected memory calculations

Note: This calculation does not apply for options 61C, 81, and 81C.

UNPROTECTED MEMORY CALCULATIONS		
CUSTOMER _____	DATE _____	
One sheet for the complete system.		
	ITEMS	WORDS
Fixed amount of storage		
Single-line TNs		
Multi-line TNs		
Add-on-modules		
Network groups		
Trunk units		
Consoles		
Customer groups		
Trunk routes		
Network loops (excluding conference)		
RPE loops		
Intergroup pairs		
Peripheral signaling cards (IPE and PE)		
SDI ports		
TDS loops		
MFS loops		
Conference cards		
DTR loops		
Call registers		
Low-priority input buffers		
High-priority input buffers		
Single-line telephone output buffers		
Multi-line telephone output buffers		
		TOTAL WORDS _____
Memory card code _____		
Capacity _____	_____ k words (1k = 1024)	
Unprotected memory cards required _____		
Memory card addresses required _____		

553-5364

Worksheet Q: Program store calculations

Note: This calculation does not apply for options 61C, 81, and 81C.

PROGRAM STORE CALCULATIONS

CUSTOMER _____ DATE _____

One sheet for the complete system.

PROGRAM NAME	STORAGE IN k (1k = 1024 words)
Basic	
Overlay area	
Read-only memory	

Memory card code _____

Total from table _____ k

Total x 1024 _____ words

Capacity _____ k words

Unprotected memory cards required _____

Memory card addresses required _____

553-4049

Worksheet R: Equipment summary

EQUIPMENT SUMMARY

CUSTOMER _____
DATE _____

One sheet for the complete system.

	QUANTITY	BASED ON
Line and trunk cards		Cutover
DTR loops		2 year
Unprotected memory cards		2 year
Protected memory cards		2 year
Conference loops		2 year
TDS loops		2 year
Call registers		2 year
Low-priority input buffers		Cutover
High-priority input buffers		Cutover
Single-line output buffers		Cutover
Multi-line output buffers		Cutover
CPUs		Cutover
IPE and PE modules		2 year
Network loops		2 year
(except conference and TDS)		
Network groups		2 year

553-5365